

## NOTES ON THE SHELLS OF THE GENUS EPITONIUM AND ITS ALLIES OF THE PACIFIC COAST OF AMERICA.

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The genus called by Lamarck, in 1799, *Cyclostoma* (type, *Turbo scalaris* Linnæus) is more commonly known by the name of *Scalaria*, which he adopted in 1801. As this shifting of a name once given is inadmissible under the rules of nomenclature we are obliged to look further for the proper name of the genus.

In the anonymous Museum Calonnianum printed by the dealer, George Humphrey, after a manuscript of Hwass in 1797, the name *Scala* is used, and for some years the present writer adopted it for the genus. However, the inconveniences incident to the adoption of the nomenclature of this publication are so great that the International Committee on Zoological Nomenclature have decided to expunge it from the list of works to be cited in nomenclature, and the next name in order, *Epitonium* of Bolten in 1798, must be adopted.

The group is distributed all over the world and is usually rich in species, but sparse in individuals in any given fauna. E. de Boury has given much attention to it, and it is to be hoped his proposed monograph may not long be delayed since such excellent illustrations of the species as those he has published on minor groups are urgently needed to identify the many closely related forms. Many of the older descriptions are so brief as not to permit of the differentiation of similar species, and even the figures, especially of the smaller species, are more or less inadequate.

Among the principal features serving to identify the species are the presence or absence of spiral sculpture, of an umbilical perforation, and of a basal cord or disk. The number of the varices is, on the whole, very constant in most of the groups, following the rule that the greatest variation will be found where the normal number of varices is greatest. In a species with few varices the number is remarkably constant, except in the group typified by *E. lineatum* Say, where the number is irregular and the varices coarse and very few. The nucleus or nepionic shell is pretty uniform throughout the group, usu-

ally smooth, elevated or turbinate, and often of a darker color than the rest of the shell.

De Boury has divided the genus into a multitude of sections, which have a certain convenience in separating the species, but which in most cases tend to merge into the adjacent groups without any very marked distinction.

The Pacific coast of America is quite rich in species and doubtless there are many more tropical forms yet to be discovered. The South American coast has been very imperfectly explored and very few species have been reported therefrom. The older authors described very briefly and imperfectly quite a number of species which can only be identified by comparison with the original types, most of which are in the collection of the British Museum. Perhaps the best and most complete single collection is that brought together by De Boury and situated in the Paris Museum.

Owing to gross carelessness on the part of the compilers there are many erroneous localities given in several of their monographs. Species from the Philippines are ascribed to the Pacific coast of America, and quite incompatible localities are given to a single species. Some of these blunders will be corrected in the present paper.

The most common of our boreal species is *Epitonium (Boreoscala) greenlandicum* Perry, 1811, with which *subulatum* Couthouy, 1838 (not of Sowerby, 1825), and *planicosta* Kiener, 1838 (not *planicostata* Bivona, 1842), are synonymous. The subgenus *Boreoscala* was instituted by Kobelt in 1902; *Arctoscala* Dall, 1909, and *Liroscala* De Boury, 1909, are synonymous. Its distribution is circumboreal, though somewhat patchy, as it is often apparently absent where it would be expected. On the Pacific coast it is found from Point Barrow to Wrangell, Alaska, and the coast of Eastern Siberia; it is fossil in the Pleistocene terraces of Japan. It exhibits much more variability than the more southern species, both in slenderness and in the number of axial ribs, which vary from 8 to 17 in number, and also in the strength of these ribs. The strong spiral sculpture seems to be tolerably constant. *E. hemphilli* Dall, 1878, from the Pliocene of San Diego, is an analogous species.

The subgenus *Opalia* H. and A. Adams, 1853 (*Psychrosoma* Tapparone Canefri, 1876), is represented on the coast by several recent species and some fine Pliocene forms. The most common recent species is *O. wroblewskii* Mörch, 1876. This is *Scalaria borealis* Gould, 1852, not of Beck, 1839. A very solid white shell with seven or eight varices, more conspicuous on the early part of the spire, and a well-marked basal disk. It ranges from Forrester Island, Alaska, south to San Diego, California, where it is found in 53 fathoms, and also in the Pleistocene of the vicinity.

*Opalia varicostata* Stearns, 1875 (not of Sacco, 1890), of the San Diego Pliocene, is a large species with 10 or 11 ribs sometimes partly obsolete. *O. varicostata* Cossmann, 1912, is synonymous. The *O. anomala* of Stearns, 1875, is practically without varices except near the tip of the spire, where traces may sometimes be found. It is an *Opalia* and not a *Crassiscala*, as supposed by De Boury. The Miocene *Catenoscala oregonensis* Dall, 1909, is accompanied by a large *Boreoscala condoni* Dall, and an *Opalia* of the *varicostata* type which I called *O. rugifera*. These large Epitoniums seem to be rather characteristic of the Northwest Coast Miocene.

A somewhat degenerate representative of the *Opalia* group is *B. pluricostata*, new species, ranging from Forrester Island, Alaska, to San Diego. It resembles the ribbed upper portion of *O. wroblewskii* a good deal, but is smaller and more cylindrical, with eight varices. It has seven whorls without the nucleus, the varices are continuous up the spire, the interspaces smooth, the basal disk octohedral from the intersection of the ribs, somewhat concave, and relatively smaller than in *wroblewskii*. Length, 16; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 56054. The type-specimen is from Neeah Bay, Washington.

Another group referred by Carpenter to *Opalia* is separated by De Boury under the name of *Dentiscala*. Representatives of this type are *D. crenatoides* Carpenter, 1864, from the Gulf of California, rather small with a coarse spiral rib on the basal disk and deep pits at the intersections of the nine axial ribs. A species which has generally been confused with this and is much more common, is *D. crenimarginata*, new species, which ranges from Monterey, California, to Puerto Libertad, Mexico. It is larger, much stouter, spirally striated, with a convex smooth basal disk, the 12 axial ribs on the last two whorls obsolete on the sides of the whorls but coronating the suture. It has 6 or 7 whorls without the nucleus, the varix at the aperture is heavy, and there is sometimes another heavy varix indicating a resting stage. Length, 16; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 111207. The type-specimen comes from La Paz. A species somewhat intermediate between the two above noted, *D. insculpta* Carpenter, 1864, is found in the Pleistocene of Santa Barbara, California, but it is without the fine spiral surface sculpture.

A smaller species, *D. nesiotica* Dall, was dredged by me in 16 fathoms at Catalina Island. It has 12 varices, rather feebly carried over the whorl and obsolete on the basal disk. Sharp spiral sculpture covers the surface and the terminal varix is heavy; there are six whorls, not including a smooth nucleus of a whorl and a half; the suture is markedly coronated by the ribs. Length, 10.5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 56900.

Another group referred to *Opalia* by Carpenter has been separated by De Boury in 1889 under the name of *Nodiscalia*. These are small, slender imperforate shells with ill-defined axial nodes or ribs, but only one true varix, which is terminal and much thickened. The shells when in good condition have a soft calcareous outer coat which is punctate or minutely sculptured, recalling the outer coat in *Chlamys*. Four species of this group have been described from the coast, *E. mazatlanicum* Dall, 1908; *E. retiporosum* Carpenter, 1864, ranging from Catalina Island to the Gulf of California; *E. spongiosum* Carpenter, 1864, from Monterey, California; and *E. mexicanum* Dall, 1908, from Acapulco.

A very distinct group of boreal forms is *Acirsa* Mörch, 1857 (*Arcisa* Nyst, 1873), founded on *Scalaria borealis* Beck, 1839 (not of Gould, 1852), of which *S. eschrichtii* (Hölboll) Möller, 1842, and *S. ochotensis* Middendorff, 1849, are synonyms. This species is circumboreal, the more southern specimens are more delicate and smaller than those from truly arctic waters, which at most form a variety which will take Middendorff's name. On the Pacific side this species ranges from Bering Straits through Bering and the Okhotsk Seas to the Aleutian Islands.

Curiously enough a minute form has been received from Cape San Lucas which appears to belong to this group, and if so was probably washed up from deep water. The shell is littoriniform, acute, with seven whorls, including the somewhat styliform smooth nucleus; the sutures are appressed, the whorls only moderately convex, with very faint axial indications of ribbing, and sharp uniform spiral striation. A prominent thread upon which the suture is laid marks the periphery. The terminal varix is inconspicuous, the margin of the aperture being thickened inside with little outside expansion. Length, 3.6; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 74020. This may take the name of *A. exopleura*.

A slender white spirally sulcate shell from the Gulf of California, described by Carpenter as *Acirsa menesthoides* in 1864, may perhaps be referred to the genus *Couthouyella* Bartsch, 1909, but its proper place awaits for determination specimens containing the operculum and soft parts.

*Ferminoscala* Dall, 1908, contains large yellow or brown species with finely reticulated surface, large basal disk, and a thick heavy terminal varix. Before the varix is formed the shell has much the aspect of *Amaea magnifica* Sowerby. *E. ferminianum* Dall, 1908, ranges from Point Fermin in the Gulf of California to Panama. *E. brunneopictum* Dall, 1908, was dredged off Cerros Island, Lower California. *E. pompholyx* Dall, 1889, ranges from Cape San Lucas to the Galapagos Islands, in deep water.

The next group in order is *Asperiscala* De Boury, 1909, of which the type is the elegant *Scalaria bellastrata* of Carpenter, 1864, which has 15-16 varices and clean-cut spiral sculpture. Its ranges from Monterey to San Pedro, California. The only other described species of this group from the coast is *E. lowei* Dall, 1906, a species with 26 varices from Catalina Island. There are quite a number of hitherto undifferentiated forms of this group in the United States National Museum collection, as follows:

EPITONIUM ACAPULCANUM, new species.

Shell small, white, acute, imperforate, with a slender three-whorled smooth nucleus and five subsequent whorls; varices 11, continuous over the suture up the spire which they nearly encircle; spiral sculpture of closely adjacent flattish threads covering the whorl; anterior face of the varices smooth, without any spinosity at the shoulder. Length, 5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 59337. Range, La Paz to Acapulco.

EPITONIUM COOKEANUM, new species.

Shell small, pink, solid, acute, imperforate, the nucleus lost, with eight well-rounded subsequent whorls; with 10 rather solid, smooth continuous white varices making less than half a turn round the spire; spiral sculpture of extremely fine uniform threads covering the whorl between the varices; the terminal varix thicker than the others; all the varices broader at the intersection with the suture but not spinose. Length, 9.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 211019. Range, San Diego to the Gulf of California.

This is named in honor of Miss J. M. Cooke, of San Diego, a most assiduous collector, to whom, and to the work of her late brother, the Museum is indebted for much interesting material.

EPITONIUM XANTUSI, new species.

Shell small, acute, white, thin, with seven well-rounded whorls exclusive of the (lost) nucleus; varices low, thin, sharp, 12 in number, continuous over the spire which they half encircle, but not expanded over the rather deep suture; spiral sculpture of flattish adjacent threads over the whole surface of the whorl between the varices; terminal varix hardly thicker, none of them spinose. Length, 5.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 4107. Range, Cape San Lucas (Xantus) and La Paz, Lower California.

EPITONIUM ARNOLDI, new species.

Shell of moderate size, white, thin, with eight well-rounded whorls exclusive of the (lost) nucleus; varices on the last whorl 13, on the first four whorls they are feeble, on the next two distinct and crowded, on the last two more distantly spaced, low, and cord-like; spiral

sculpture of extremely fine close-set striae; terminal varix not enlarged, the varices not continuous over the suture nor enlarged or spinose; aperture obliquely ovoid. Length, 14; diameter, 5.5 mm. U. S. Nat. Mus. Cat. No. 106875. Range, beach at San Pedro, California, Delos Arnold.

**EPITONIUM PACIS, new species.**

Shell white, thin, with eight well-rounded whorls exclusive of three smooth, acute, nuclear turns; varices 18, with wider interspaces, narrow, thin, smooth, not generally continuous, with a small sharp short spine a little distance in front of the suture; spiral sculpture of, on the last whorl, about 20 sharply defined threads, mostly with wider interspaces, in which there are fine spiral striulae; there is a smooth space in front of the suture and another around the narrowly perforate umbilicus, without spiral sculpture; aperture ovoid; operculum blackish, concave, of about three whorls. Length, 12.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 96821. Range, in the vicinity of La Paz, Lower California, in 10 to 45 fathoms.

**EPITONIUM EMYDONESUS, new species.**

Shell minute, white, with two smooth, polished, nuclear, and four and a half subsequent well-rounded whorls; varices 14, sharp, hardly reflected, not continuous over the suture, slightly crenulated by the spiral sculpture of distinct, close, rounded threads; base rounded, imperforate; aperture rounded. Length, 3.5; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 194995. Range, Galapagos Islands, in 40 fathoms, sandy bottom.

**EPITONIUM IMPERFORATUM, new species.**

Shell small, white, with two polished nuclear and four or five subsequent rounded whorls with a deep suture and imperforate base; varices 20 or 21, low, narrow, with wider interspaces, not continuous over the suture, and having a small angle at the shoulder which gives a slightly turrated aspect to the spire; spiral sculpture of close-set similar spiral threads covering the whole surface between the varices; aperture ovate. Length, 4.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 211391. Range, off La Paz, Lower California, in 26 fathoms.

**EPITONIUM ONCHODES, new species.**

Shell minute, white, thin, with two smooth nuclear and four rapidly enlarging subsequent whorls; base minutely perforate; varices 19, thin, low, sharp, not spinose or continuous over the very deep suture; spiral sculpture of uniform, very fine, close-set threads covering the whole whorl between the varices; aperture obliquely ovate. Length, 3; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 211786a. Range, Panama Bay in 62 fathoms, sand.

## EPITONIUM LAGUNARUM, new species.

Shell small, thin, white, with six rounded whorls exclusive of the (lost) nucleus; varices 16, low, narrow, widely spaced, passing over the entire whorl; spiral sculpture of extremely fine striae, with a single thread on the periphery and a stronger one; marginating the imperforate base, on which the suture is laid; aperture obliquely ovate, the margin slightly produced in front and near the suture. Length, 7.5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 253024. Range, Laguna Beach, California, J. J. White.

## New section PICTOSCALA Dall.

In spite of the numerous sections proposed by M. de Boury, he does not seem to have designated one to receive shells of the type of *Scalaria lineata* Say, 1822 (not of Kiener, 1838). These forms have a more or less dark colored body with a feebly developed basal disk, fine spiral striation, rather numerous small varices, and a few irregularly distributed very much heavier varices, including the terminal one. A single species of this group occurs at Panama. In allusion to the coloration I propose *Pictoscala* for these forms.

## EPITONIUM (PICTOSCALA) PURPURATUM, new species.

Shell small, dark purple, with seven well-rounded whorls, exclusive of the (lost) nucleus; minor varices linear, low, about 18 in number, major varices one or two, white and conspicuous; spiral sculpture extremely fine striae visible under magnification; base rounded, imperforate, the disk feebly marked; aperture ovate, the thickened margin nearly or quite interrupted over the body. Length, 10; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 252242. Range, beach at Old Panama, Doctor MacDonald.

*Epitonium (Cirsotrema?) montereyense* Dall, 1907, has 11 varices and ranges from Monterey to San Pedro, California.

The subgenus *Sthenorytis* Conrad, 1862, contains some of the most noble species of this family both recent and fossil. *Stenorhytis* Cossmann, 1912, is synonymous. *Pseudosthenorytis* Sacco, 1891, does not seem to differ materially. Only one species is yet known from the Pacific coast, *S. turbinum* Dall, 1908, from 300 fathoms, near the Galapagos Islands. It has 10 varices.

Coming now to the group which has no spiral sculpture, often referred to *Clathrus* Oken, 1815, and called by De Boury *Nitidoscala* in 1908, we find the Pacific coast well supplied with species. The most conspicuous of the northern ones is *E. indianorum* Carpenter, 1865, which has 12 to 13 varices and ranges from Forrester Island, Alaska, south to Todos Santos Bay, Lower California.

A similar but more slender shell, with usually 11 or 12 varices and a narrow, purple brown line in front of the suture, is *E. tinctum* Carpenter, 1865. I consider the species quite distinct from *indianorum*

to which Carpenter referred it as a variety. It is notable that the brown line, so distinct in fresh specimens, gradually fades out in the cabinet, though kept in the dark. The range of this species is from Monterey to the Gulf of California.

In 1856 Carpenter described from Panama a species of *Nitidoscala* with eight varices, under the name of *S. hindsii*. By some confusion he transferred the name in 1865 to a well-known form from California which has 11 to 14 varices and ranges from Monterey to the Gulf of California, but so far as known does not reach Panama. For the Californian shell I propose the name of *Epitonium (Nitidoscala) fallaciosum*.

Other species are *E. subcoronatum* Carpenter, 1869 (*Spiniscala* De Boury, 1910), with 11 varices, ranging from Vancouver Island to San Diego; *E. acrostephanus* Dall, 1908, with 14 to 17 varices, ranging from Monterey to the Coronado Islands; and *E. crebricostatum* Carpenter, 1869, with 9 to 11 varices, ranging from Vancouver Island to the Gulf of California. This latter is not *S. (Funis) crebricostata* Stanley Gardner, 1876.

Undescribed forms related to the preceding are as follows:

EPITONIUM DENSICLATHRATUM, new species.

Shell white, solid, with 6 or 8 well-rounded whorls exclusive of the (lost) nucleus; varices 10 or 11, sharply axially grooved on their anterior faces, solid, thick, not continuous over the suture, on the base showing a slight flattening, though there is no basal cord or disk; aperture ovate; behind the inner margin there is a narrow flattened area reflected over the umbilical region in the type-specimen. Length, 17; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 111209. Range, Puget Sound and Neeah Bay, Washington.

This form was segregated by Carpenter in the Stearns collection under the above name, but never published.

EPITONIUM PERSUTURUM, new species.

Shell with three smooth brown nuclear and five subsequent thin white whorls separated by an unusually deep suture; varices 10, narrow, rounded, continuous up the spire which they encircle about half way, but not expanded at the suture into which they dip; the whorls are slightly flattened above the shoulder, but there is no corresponding angle or spine on the varices. Length, 15.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 211021. Range, beach at San Diego, California.

EPITONIUM COLPOICUM, new species.

Shell white, with one blunt nuclear and five subsequent, rapidly enlarging well-rounded whorls; varices nine, continuous over the suture, which is deep, and so expanded there as to form pit-like cavities of the interspaces; the varices are thin, sharp, rather wide, and hardly



reflected; in ascending to the apex of the shell they nearly half encircle it; base rounded, imperforate; the terminal varix does not touch the body whorl and is buttressed by the anterior ends of the preceding varices. Length, 9; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 46213. Range, Gulf of California (Stearns).

EPITONIUM PAZIANUM, new species.

Shell chalky white, thin, smooth, with seven rounded, almost separated whorls exclusive of the (lost) nucleus; varices nine, thin, sharp, with a spinule at the shoulder, continuous over the suture into which they descend and making nearly half a turn around the spire before reaching the apex; base rounded, imperforate; aperture rounded, the inner anterior margin somewhat produced; the margin nowhere attached to the body whorl. Length, 20; diameter, 9 mm. U. S. Nat. Mus. Cat. No. 111208. Range, La Paz, Lower California, in 112 fathoms.

EPITONIUM HEXAGONUM Sowerby, 1844.

Has six varices, as its name implies, and this number seems invariable. The shell is pure white, the smoothness and regularity of its shape are very pleasing and give, together with its solidity, a special aspect to the species. It ranges from Santa Cruz, California (Button, collector) to Panama.

EPITONIUM PROPEHEXAGONUM, new species.

Shell of 10 whorls, livid flesh color with white varices, otherwise closely resembling *E. hexagonum* in form but larger; rarely with seven varices; first whorl of the nucleus small, smooth, white; second with 12 low rounded varices; subsequent whorls with the normal six continuous over the suture, half encircling the spire, finely striated on the anterior face, a slight angle at the shoulder but much less prominent than in *E. hexagonum*. Length, 21; diameter, 9.5 mm. U. S. Nat. Mus. Cat. No. 153075. Range, Gulf of California and Mazatlan.

Adult *hexagonum* measures about 14 mm. in length and 6 in diameter, and is relatively more acute with apparently deeper suture. The varical angle is only fully developed on the later whorls, when it is often spinose. The front of the varices is not striated.

EPITONIUM EUTAENIUM, new species.

Shell small, thin, slender, white, acute, with eight whorls, including the blunt smooth nucleus; varices eight, low, narrow, sharp, continuous over the deep suture into which they dip; a slight angle at the shoulder, the front face of the varices smooth; aperture transversely oval, the lateral margins slightly produced. Length, 11; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 201201. Range, Gulf of California.

*EPITONIUM APICULATUM*, new species.

Shell small, white, with a smooth slender elevated nucleus of two and a half whorls and five rapidly enlarging subsequent whorls; varices eight, sharp, high, thin, with an acute angle at the shoulder, continuous over the deep suture into which they dip, half encircling the spire; on the base the varical edges are flatly reflected; on the later whorls the shoulder angle becomes a prominent spine; aperture ovate, slightly produced in front. Length, 4; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 111219. Range, Lower California to Panama Bay, in 30 fathoms.

*EPITONIUM COMPRADORA*, new species.

Shell minute, white, with a very small acute nucleus of two and a half smooth whorls and five or more rapidly enlarging subsequent whorls separated by a rather deep suture; varices 13, with a blunt angle at the suture, giving the profile of the whorls a somewhat tabulate aspect; varices thin, sharp, erect; base rounded, aperture subovate, anterior faces of the varices smooth. Length, 4; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 105527. Range, Point Abreojos, Lower California, to the Gulf of California,

Possibly immature, but apparently distinct from the young of any of the allied species.

*EPITONIUM CYLINDRICUM*, new species.

Shell small, white, thin, subcylindrical, with five whorls exclusive of the (lost) nucleus; suture moderately deep; varices 13, low, thread-like, not continuous over the suture, not angulate; base evenly rounded, aperture subovate. Length, 4; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 271037. Range, near La Paz, Lower California, in 21 fathoms.

*EPITONIUM CENTRONIUM*, new species.

Shell small, white, acute, slender, with three elevated smooth nuclear and about five subsequent whorls; suture deep; varices nine, thin, sharp, erect, with a spinose angle about halfway between the suture and the periphery, continuous over the suture on the spire which they nearly encircle; terminal varix duplex, anterior faces of the varices striated; aperture rounded, the inner margin buttressed by the preceding varices, not touching the body whorl. Length, 4.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 211395. Range, Gulf of California, in 7 to 26 fathoms.

*EPITONIUM TIARA* Carpenter, 1856.

This species has 12 varices and ranges from Catalina Island to Todos Santos Bay, Lower California, according to specimens so named by Carpenter in the Stearns collection. It was originally described

from Panama, and I feel some doubt as to whether the Californian species is conspecific with that from Panama, but the question can only be settled by a comparison with the type in the British Museum.

EPITONIUM COLUMBIANUM, new species.

Shell acute, yellowish white, with nine whorls exclusive of the (lost) nucleus; varices 18, low, rounded, more or less striated, without any angulation, continuous over the suture into which they dip and nearly encircling the spire; the type-specimen has the interspaces more or less finely axially striated, but the southern specimens seem quite smooth; base and aperture rounded, the anterior margin of the latter slightly angular. Length, 21; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 111211. Range, off the Columbia River, Oregon, in 27 fathoms, and south to Point Abrejos, Lower California, in 44 fathoms.

The most prominent characteristic of this species is the regularity of all its features. It is the largest of those species of the coast which have unarmed varices.

EPITONIUM SAWINAE Dall, 1907.

This species has 16 to 19 varices more or less flatly reflected on the base, and ranges from Vancouver Island to San Diego, California, and possibly to the Gulf of California.

EPITONIUM SAWINAE, variety? CATALINENSE, new variety.

Shell with a small three-whorled nucleus, smooth and white, and seven and a half subsequent whorls; varices 22 to 24, not spinose or angular, not regularly continuous over the suture, with the anterior faces of the varices finely lamellose or deeply striated. Base rounded with a minute umbilical perforation in the adult; aperture nearly circular. Length, 13.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 109502. Range, off Catalina Island, California.

It differs from *sawinae* by the absence of angularity on and the greater number of the varices, and by the umbilical perforation.

EPITONIUM MONTEREYENSE, new species.

Shell small, white, rather solid, with six whorls, exclusive of the (lost) nucleus; varices 14, low, rather solid, striated, not angulated, largely continuous over the suture, encircling about one-fourth of the spire, widely flatly reflected on the base, the reflection covering at least half the interspace, the whole giving the effect of a disk though there is no basal disk or cord; aperture subovate, the anterior margin somewhat produced. Length, 6; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 111217. Range, Monterey Bay, in 30 fathoms.

## EPITONIUM CALIFORNICUM, new species.

Shell small, white, solid, with seven whorls and a very small brownish nucleus of a whorl and a half; varices 9 or 10, low, sharp, reflected, anteriorly axially striated, with a very small sharp spine at the shoulder; suture deep, the whorls almost separated, rounded; base rounded, imperforate; aperture short-ovate, its inner margin resting on the preceding varices, not touching the body of the whorl. Length, 10.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 201202. Range, San Miguel Island, California, to the Gulf of California.

## EPITONIUM RECTILAMINATUM, new species.

Shell minute, whitish, with three polished blunt nuclear and four subsequent whorls; varices 18 or 19, low, uniform, straight, not continuous over the suture, with equal interspaces, sharp and erect; without angle or spine; base rounded, imperforate; aperture rounded, slightly oblique. Length, 3.5; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 110430. Range, Monterey Harbor, California, in 12 fathoms, to the Gulf of California. A quite similar but more rapidly increasing species is found at the Galapagos Islands, in 634 fathoms, but the specimen is too immature to name.

## EPITONIUM CAAMANOI Dall and Bartsch, 1910.

Has 12 varices rather broadly and flatly reflected and comes from Barkley Sound, Vancouver Island, in 7 to 10 fathoms.

## EPITONIUM TABULATUM, new species.

Shell slender, acute, thin, dull white, with two and a half smooth nuclear and 12 or more subsequent whorls; varices 16, thin, sharp, well reflected, anteriorly striated, with a blunt angle at the shoulder, behind which the varix is somewhat concave, giving a tabulate profile to the whorls; the varices more than half encircle the spire, being continuous over the spire; in perfect specimens there is a very thin calcareous outer layer to the shell; base rounded, aperture rounded, the reflected margin narrow. Length, 18; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 109569. Range, San Pedro, California, to the Coronado Islands.

The length given above is of the decollate type specimen of five whorls; the entire length, if perfect, would be about 25 mm. It is a *Crisposcala*.

## EPITONIUM APPRESSICOSTATUM, new species.

Shell slender, acute, white, with two and a half smooth nuclear and six or seven subsequent whorls; varices 13, low, flat, closely appressed to the whorl, continuous over the suture and nearly half encircling the spire; suture moderately deep, base rounded, imperforate, aperture subovate, the margin slightly angular in front.

Length, 14; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 59334. Range, Acapulco, Mexico.

EPITONIUM MUSIDORA, new species.

Shell thin, white, slender, with an acute spire and deep suture; varices 10 or 11, low, thin, sharp, slightly reflected, anteriorly smooth, continuing over the suture into which they dip, and making a nearly complete circuit of the spire; base rounded, aperture subovate; there is a slight broadening of the varix at the shoulder of the whorl, but no angulation. Length, 13; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 201203. Range, San Diego to Panama.

EPITONIUM COLUMNELLA, new species.

Shell small, white, with about five whorls exclusive of the (lost) nucleus; the whorls rather rapidly enlarging; varices 11, high, thin, angular and spinose at the shoulder, and distinctly angular at the margin of the base, on which the reflected portion is distinctly flattened, but with no basal disk or cord; base imperforate, aperture rounded, the reflected margin produced at the shoulder and in front. Length, 2.75; diameter, 1.75 mm. U. S. Nat. Mus. Cat. No. 111220. Range, Panama Bay, in about 30 fathoms.

EPITONIUM BERRYI Dall, 1907.

This species has 22 varices without angles or spines and ranges from San Pedro Bay in 200 fathoms to San Diego in about 75 fathoms. It is of the type of the West Indian *E. inconspicuum* Sowerby, 1847, but much smaller.

EPITONIUM HABELI, new species.

Shell small, acute, conical, white, with five rounded whorls exclusive of the (lost) nucleus; varices 16, low, rather thick, not reflected or angular, continuous over the suture and making about half the circuit of the spire; upper whorls delicately spirally striate, the sculpture becoming obsolete on the fourth and entirely absent from the last whorl; base rounded, with a small umbilical perforation; aperture rounded, the reflected margin produced near the axis in front. Length, 7.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 56055. Range, Galapagos Islands, collected by Dr. Simon Habel.

This species completely bridges the gap between *Asperiscala* and *Nitidoscala*.

EPITONIUM DIEGENSE, new species.

Shell minute, whitish, with five whorls exclusive of the (defective) nucleus; varices 11 to 12, sharply anteriorly striated, angular at the shoulder, continuous over the suture, and making about half the circuit of the spire; base rounded, imperforate; aperture subovate, the reflected margin angular at the shoulder. Length, 5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 211904. Range, San Diego to La Paz, in 7 to 10 fathoms.

## EPITONIUM TABOGENSE, new species.

Shell small, short, conic, white, with nearly three smooth nuclear and four or five subsequent whorls; varices 11, sharp, erect, not continuous over the suture, not angulated or spinose at the shoulder, anteriorly smooth; base rounded, imperforate; aperture subcircular, the thickened margin nearly interrupted over the body. Length, 3; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 211786. Range, Panama Bay, near Taboga Island, in 62 fathoms.

## EPITONIUM CATALINAE Dall, 1908.

Shell of moderate size, slender, whitish, with three smooth, brownish nuclear whorls and seven or more subsequent whorls; varices 14 or 15, angular or even subspinose above, tabulating the profile of the spire, below the shoulder flatly greatly expanded, the distal edge often coalescing with the next preceding varix, the base imperforate, aperture rounded. U. S. Nat. Mus. Cat. No. 198628. Range, Catalina Island to San Diego, California.

The varical margins being very thin are usually more or less broken, but a complete and perfect specimen would probably show a large percentage of coalescence nearly covering the later part of the shell proper. This species would be referred by De Boury to the section *Crisposcala*.

## EPITONIUM REGUM, new species.

Shell small, whitish, acute, with three smooth nuclear and seven or more subsequent whorls; varices 19 to 20, strongly anteriorly striated, narrowly flatly reflected, continuous over the suture and making about half the circuit of the spire, the anterior faces of the varices slightly irregularly crenulated; they are sharply angulated at the shoulder, giving the profile a turriculate aspect; base rounded, imperforate; aperture rounded, the reflected margin narrow. Length of five whorls, 9; maximum diameter, 4; diameter at decollation, 0.8 mm. U. S. Nat. Mus. Cat. No. 206596. Range, off Point Reyes, in 61 fathoms; off San Diego, in 48 to 78 fathoms.

This species is of the same general type as *E. catalinae*, but has more numerous and less expanded varices, which are obsoletely crenated.

## EPITONIUM ORCUTTIANUM, new species.

Shell small, white, acute, with two smooth, short nuclear and six subsequent whorls; varices 10 to 12, narrow, erect, with a narrow reflection and an angle or even a small spine at the shoulder, not continuous over the suture, the anterior surface smooth, the base imperforate. Length, 6.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 273998. Range, San Diego Harbor, foot of Broadway, C. R. Orcutt.

## EPITONIUM BIALATUM, new species.

Shell stout, short, white, with a flesh-colored peripheral band in the later whorls; two short, smooth nuclear and six subsequent whorls; varices seven or eight, white, solid, erect, with a produced angulation at the shoulder, smooth anteriorly, continuous over the suture and making about half the circuit of the spire; base imperforate, aperture subovate, the reflected margin broad and much produced at the shoulder and in front. Length, 15; diameter, 10 mm. U. S. Nat. Mus. Cat. No. 180798. Range, Gulf of California, near La Paz, in 10 fathoms, and West Mexico.

This is a specially well marked species, perhaps related to *E. statuminatum* Sowerby.

## EPITONIUM ZEPHYRIUM, new species.

Shell white, polished, solid, conic, with about five whorls exclusive of the (lost) nucleus; varices, nine, low, continuous, and bridging the suture, encircling about one-third of the spire in ascending to the apex, with smooth interspaces; varices smooth in front and without spines or angulation; base rounded, imperforate, without disk or cord; aperture subovate with narrow margin somewhat expanded in front and at the suture. Length, 11.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 56056. Range, San Diego, California.

## EPITONIUM BASICUM, new species.

Shell white, with a brownish narrow band in front of the suture when fresh, with seven whorls exclusive of the (lost) nucleus; varices 11, low, rounded, cord-like, continuous over the suture into which they dip, and making nearly half a turn in ascending around the spire, one or two near the terminal are larger than the rest; interspaces smooth; base rounded, marginated by a strong cord, imperforate; aperture subovate, the margin narrow, somewhat patulous in front. Length, 15; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 56049. Range, Gulf of California to Panama.

## EPITONIUM ROBERTI, new species.

Shell white, solid, rather short, with two smooth nuclear and six subsequent whorls; varices 13, smooth, low, erect, continuous over the suture into which they dip, and encircling about one-fourth of the spire in ascending to the apex; base rounded, imperforate, marginated by a slender not prominent cord; aperture subovate, with a narrow margin, slightly wider on the side of the axis; the varices on the later whorls are without angulation or spines, but on the early whorls a small spine is developed at the shoulder which in subsequent whorls becomes obsolete and finally lost. Length, 12; diameter, 6.5 mm. U. S. Nat. Mus. Cat. No. 46251. Range, Gulf of California, Dr. Robert E. C. Stearns.

**EPITONIUM RHYTIDUM, new species.**

Shell small, subcylindric, pinkish white, strongly sculptured, of about 10 whorls exclusive of the nucleus which is missing. The type specimen retains six whorls, rounded and with a deep suture; varices 18 or 19, low, rounded, crenate; whorls spirally sculptured with (on the last whorl seven or eight) flattish cords; base flattish, nearly smooth, imperforate, margined by a strong cord; aperture rounded. Length of decollate type-specimen, 5.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 207604. Range, Galapagos Islands, in 40 to 634 fathoms.

This little shell has a remarkable sculpture, recalling some *Pyramidellids*, none of which, however, have a reflected margin to the lip. It is probable that its habitat is in the shallower water, and the presence of the broken specimen in the deep water adventitious.

It is quite likely that among De Boury's numerous sections there is one (perhaps *Fumiscala*) into which this would fit, but not having typical specimens of all of them for comparison I refrain from selecting a sectional name for it.

**EPITONIUM ZETEKI, new species.**

Shell small, white, thin, with about 8 whorls, the nucleus of about one and a half glassy rounded whorls (with a portion lost?); last whorl with obscure, close-set spiral striae, with no basal disk or cordon; whorls rounded, suture deep; there are 11 sharp, erect, rather low varices, smooth on the front with no spines or angles, descending into the suture and regularly continuous over the spire, which they about half encircle; aperture nearly circular, axis imperforate. Height, 6.0; maximum diameter, 3.0 mm. U. S. Nat. Mus. Cat. No. 324463. Range, Panama, collected by Mr. James Zetek.

This species is nearest to *xantusi* but is more solid, has continuous varices, less emphatic spiral sculpture, and increases more rapidly in diameter. The former has not been found at Panama

**EPITONIUM IMBEX, new species.**

Shell minute, white, thin, with six or more whorls, the nucleus eroded and the last whorl of the type-specimen incomplete; there is no spiral sculpture, basal disk, or cordon; on the last whorl are about 22 varices, thin, low, smooth, protractive behind at the suture, with a hint of angulation at the periphery and remarkably arcuate on the imperforate base; the varices are continuous, somewhat appressed at the suture, and encircle about one quarter of the spire. Height, 2.3; diameter of last whorl, 1.0 mm. U. S. Nat. Mus. Cat. No. 324464. Range, beach at Panama, James Zetek.

This little species has more varices in proportion to its size than any other thus far reported, and is remarkable for the sigmoid arcuation of the varices.



## EPITONIUM THYLAX, new species.

Shell small, white, solid, with 8 sharp-edged solid continuous varices; nucleus conic with three smooth whorls; subsequent whorls seven, feebly spirally striate, needing strong magnification to make it out; varices not descending deeply into the suture, nearly parallel with the axis, without angulation or spines; there is no basal disk or cord, the aperture is ovate, the base imperforate. Height, 6.25; diameter, 2.6 mm. U. S. Nat. Mus. Cat. No. 324465. Range, beach at Panama, James Zetek.

This species except for its spiral striation recalls in miniature such forms as *cookeianum*, *hexagonum*, etc.

The following species are not represented in the collection of the United States National Museum.

## SCALARIA ACICULINA Hinds, 1843.

This is a slender purple brown species with about 12 arcuate varices and 10 whorls. It is imperforate and the varices are not spinose at the shoulder. The shell is about 8.5 mm. long and is said to come from the west coast of Central America.

## SCALARIA VULPINA Hinds, 1843.

This is about 6 mm. long with about 8 whorls of a reddish brown color, slender, acute, spirally striated, with a strong basal cord, and is said to come from the island of Quibo, Veragua, Central America. The figure suggests a resemblance to *S. retiporosa* Carpenter.

## SCALARIA CRASSILABRIS Sowerby, 1847 (not of von Koenen, 1885).

Is probably a Philippine shell wrongly reported from Mazatlan.

## SCALARIA GRACILIS Sowerby, 1844.

Was originally described as a Philippine shell, and its reference to the west coast of America is due to a misidentification. It is not *S. gracilis* A. Adams, 1862, nor of H. Adams, 1860, nor Verrill, 1880. It is the type of *Graciliscala* De Boury, 1909.

## CIRSOTREMA FUNICULATA Carpenter, 1857 (not of Watson, 1883).

Has two spiral ribs on the base and 15 to 20 varices. It is described from Mazatlan and resembles *S. diadema* Sowerby, 1832, of the Galapagos fauna.

## SCALARIA INDISTINCTA Sowerby, 1844.

Has fine spiral sculpture and many simple uniform axial varices. It is reported from San Blas and the Gulf of California.

## SCALARIA MITRAEFORMIS Sowerby, 1844.

Was described from Guacomayo, Central America.

## SCALARIA SUPRASTRIATA Carpenter, 1857.

From Mazatlan, has the whorls not touching, is imperforate, with acute spire. It has 12 acute varices and a small spine at the shoulder.

## SCALARIA OBTUSA Sowerby, 1844.

From Santa Elena, Ecuador; is not the species so named from Panama by C. B. Adams.

## SCALARIA REGULARIS Carpenter, 1856.

Has 9 whorls and 10 to 12 sharp varices. There is obsolete spiral sculpture on the early whorls. It is a Panama species.

## SCALARIA CUMINGI Carpenter, 1856.

Was also described from Panama. It has 8 or 9 varices.

## SCALARIA DIADEMA Sowerby, 1832.

Is a Galapagos species.

## SCALARIA RARICOSTATA Carpenter, 1857.

From the Gulf of California; has 8 slender varices. It is *S. carpenteri*, Tapparone Canefri, 1876, not *raricosta* Lamarck, 1822, nor of Costa (1844?). It belongs to *Punctiscala* De Boury, 1890.

## SCALARIA REFLEXA Carpenter, 1855.

From San Blas, has 5 varices, with spout-like or subtubular spines. This is referred to *Hirtoscala* Monterosato, 1890, by Cossmann.

## SCALARIA STATUMINATA Sowerby, 1844.

Belongs to the general group which includes *Epitonium bialatum*. It was described from Payta, Peru. It is also reported from Panama Bay, near Taboga Island.

## SCALARIA POLITA Sowerby, 1844.

Was described from Xipixapi, Ecuador, and is referred to *Longiscala* De Boury, 1910.

## SCALARIA ELENENSIS Sowerby, 1844.

Came from Santa Elena, Ecuador.

## SCALARIA PRINCIPALIS Pallas, 1774.

Of which *S. costulata* Kiener is a synonym, is reported from West Colombia, which is certainly erroneous. Gmelin states that it is a native of Coromandel, and Cossmann refers it to the Philippines. The west Colombian shell is *ducalis* Mörch, 1876, and was named by Tapparone Canefri *S. simillima* in the same year.